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Ocean Dynamics: Vietnam DRI

Robert Pinkel

Marine Physical Laboratory

Scripps Institution of Oceanography

La Jolla California 92093-0213

Phone: (858) 534-2056 fax: (858) 534-7132 email: rpinkel@ucsd.edu

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LONG-TERM GOALS

To gain a more complete understanding of ocean dynamical processes, particularly at fine-scale, through comparison of high, mid- and low-latitude observations, near the sea surface, in the main thermocline, and near the sea floor.

OBJECTIVES

To identify the phenomena involved in the cascade of energy from meso-scales to turbulent scales. In particular, we wish to quantify the relationship between fine-scale background conditions and the occurrence of microscale breaking.

APPROACH

Progress is achieved through a steady-state cycle of instrument development, field observation and data analysis. The primary instruments employed include Doppler sonar and rapidly-profiling CTD's. Our instruments produce information that is quasi-continuous in space and time, typically spanning two decades in the wavenumber domain. This broad band space-time coverage enables the investigation of multi-scale interactions.

WORK COMPLETED

Our major accomplishment has been participation, along with other DRI PIs, in the negotiation process that will allow a UNOLS research vessel to work in Vietnamese waters in Spring 2013. This is planned to be an educational cruise, primarily. We are preparing a Wirewalker profiling float (Figure 1) and a Livewire power-generating float (Figure 2) for the educational deployments on the spring cruise. The cruise will provide the first opportunity to test a Livewire in open ocean conditions. Conditions in the Vietnam East Sea can be contrasted with those on the Equator in Dynamo (Figures 3,4).

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Figure 1. A Macro WW being deployed in the Dynamo experiment.

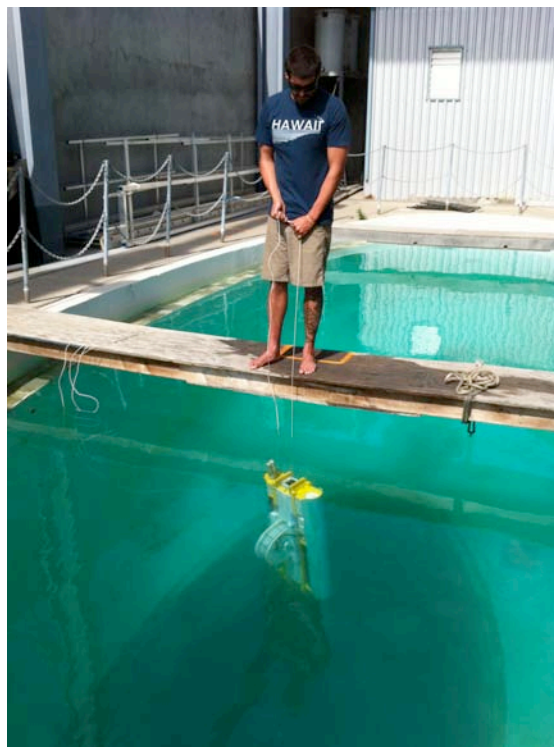


Figure 2. A Livewire power-generating float being tested at SIO. This first-generation device produces nearly 1 W in calm conditions. It is hoped that future devices will produce 1-5 W in typical oceanic conditions.

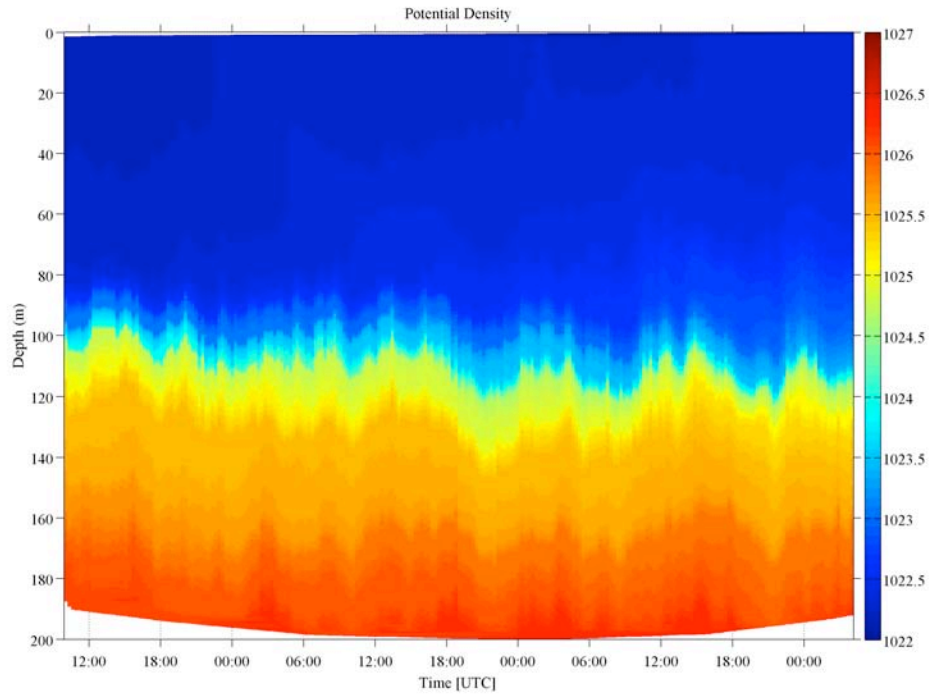


Figure 3. Potential density from a free-drifting MacroWW. Tidal and higher frequency internal waves are present. There is also complex density structure in the mixed layer, poorly seen in this color contouring. (San Nguyen)

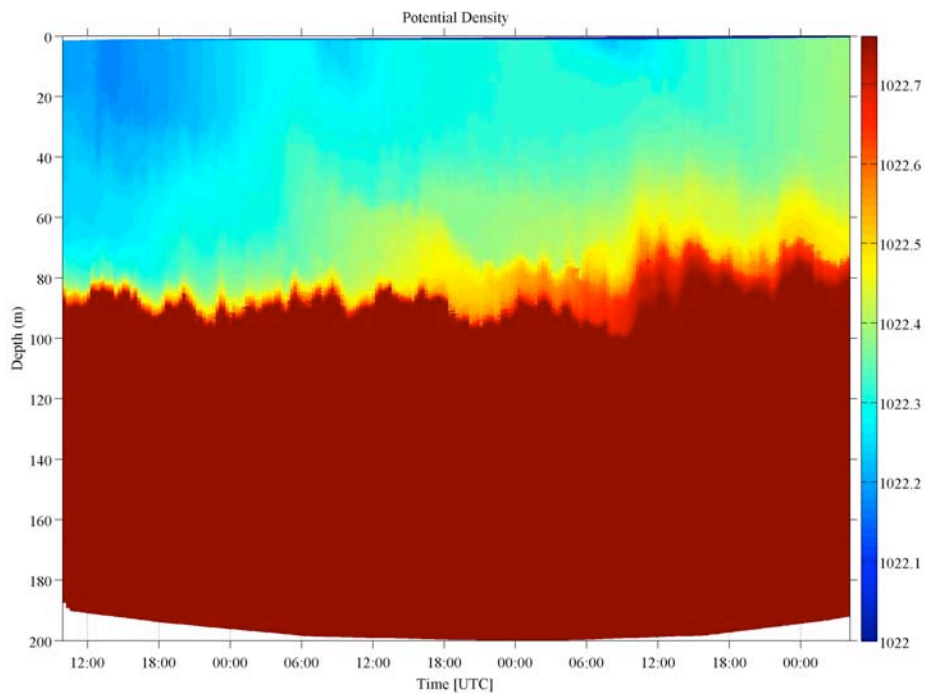


Figure 4. A re-plot of Figure 2 with the color map featuring mixed layer structures. Data are from Buoy 2, WW#5. (San Nguyen), taken on the equator in the Indian Ocean as an aspect of the Dynamo Experiment.

RESULTS

None so far.

IMPACT/APPLICATIONS

If the Spring 2013 cruise is successful, it will pave the way for coming Winter and Summer 2014 data collection cruises off Vietnam on a UNOLS vessel. It is planned to use Wirewalker / Livewire technology extensively on the summer 2014 cruise.

TRANSITIONS

Following the 2013 cruise, two macro-Wirewalker systems will be tested and provided to Vietnamese science teams.

Our group has been developing the “macro” and “mini” Wirewalkers, as well as the “Livewire” wave-powered electrical generator. A number of these devices are planned for use in the coming ONR Vietnam and Sri-Lanka DRIs. The technology has been transitioned.

The first commercial Wirewalker vehicles are now being produced and sold by Brooke Ocean Technology, US.

RELATED PROJECTS

Sri-Lanka DRI, in planning

PUBLICATIONS

Pinkel, R., M. A. Goldin, J. A. Smith, O. Sun, A. Aja, M. N. Bui, T. Hughen. The Wirewalker, a vertically profiling instrument package powered by ocean waves. J Atmospheric and Oceanic Tech., 2010.

Smith, J.A., R.Pinkel, M.Goldin, O.Sun. S, Nguyen, T.Hughen, M. Bui, and T.Aja. Wirewalker Dynamics. J Atmospheric and Oceanic Tech., 2011.

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